Value of Fine-Needle Aspiration Cytology in the Evaluation of Parotid Tumors

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Abstract Fine needle aspiration cytology (FNAC) is commonly used in the study of parotid masses; however controversy exists regarding its diagnostic accuracy. The objective of this study was to evaluate the effectiveness of FNAC as a preoperative diagnostic tool of parotid tumors. Sixty-five patients had satisfactory preoperative FNAC and underwent subsequent surgery to the parotid between March 2002 and July 2009 at our institution. The results of the FNAC were compared to the permanent histopathological diagnosis. The sensitivity, specificity, positive predictive value, negative predictive value, and the overall accuracy of FNAC for parotid masses were 57.9, 97.8, 91.7, 84.9, and 86%, respectively. FNAC is useful in the preoperative assessment of parotid tumors and surgical planning. The non-diagnostic and false-negative results are the limitations of FNAC that should be reduced to improve its usefulness in the evaluation of parotid tumors.

Keywords Fine-needle aspiration · Parotid tumor · Salivary gland · Preoperative evaluation · False-negative results

Introduction

Fine-needle aspiration cytology (FNAC) has gained widespread acceptance and popularity among head and neck

surgeons in the assessment of thyroid and neck masses but its use in the evaluation of parotid tumors has not been uniformly accepted. Batsakis et al. [1] believe that most parotid masses ultimately require surgery and the preoperative FNAC has little influence on clinical management. Furthermore, the sensitivity and specificity of FNAC for parotid tumors is between 57–98 and 86–100%, respectively, and hence, some authors believe that it is not accurate enough to influence the decision-making process [2, 3]. By other authors, FNAC permits the distinction between reactive inflammatory processes, which may not require surgery, and benign and malignant neoplasms [4, 5].

The diagnosis obtained from FNAC is a valuable aid in planning the operating time and approach to intervention, especially in cases in which the need for radical surgery will have substantial implications for esthetic and functional outcomes [6]. The preoperative cytological evaluation of the lesion obtained from FNAC can be used in counseling the patient regarding the nature of their disease and the treatment options available [7].

The objective of this study is to assess the sensitivity and specificity of FNAC in the diagnosis of malignant and benign neoplasms of parotid.

Materials and Methods

From March 2002 to July 2009, a total of 170 parotidectomies were carried out in the Department of Otolaryngology, Head and Neck Surgery at the Hazrat Rasoul Akram Hospital.

From these subjects, a subset of 70 patients (41.1% of the total) who underwent preoperative FNAC was selected. Preoperative cytological findings were classified as benign and malignant.

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We compared the histopathology of the surgical specimens with the preoperative cytology of FNAC specimens and calculated the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and overall accuracy of FNAC for diagnosing of benign and malignant parotid masses. The obtained results were analyzed using SPSS (version 11.0). This study has gained ethical approval from Ethical Research Committee of Otolaryngology, Head and Neck Research Center, Tehran University of Medical Sciences.

Results

Five patients with inadequate smears were excluded from this series. So 65 patients had both preoperative satisfactory FNAC and final histological diagnosis and made up our study group. There were 35 male and 30 female with mean age of 39 years.

All of the patients had unilateral parotid masses. The preoperative FNAC and final histopathological results are shown in Table 1. Pleomorphic adenoma (49% of all

masses) and mucoepidermoid carcinoma (14.3% of all masses) were respectively the most benign and malignant parotid masses in our cases (Table 2).

In this series, the sensitivity of FNAC was 57.9%, the specificity 97.8%, the PPV 91.7% and the NPV 84.9%. Overall accuracy of FNAC in diagnosis of parotid masses was 86%.

Discussion

FNAC is a safe and easy diagnostic procedure that causes little discomfort to the patient. Previous concerns regarding FNAC included risks of hemorrhage, facial nerve trauma, acute parotitis and the risk of tumor seeding [8–10]. These concerns have been mostly discounted and replaced by concerns as to whether the test is useful and whether it actually affects treatment decisions [9]. For practical purposes, the most important goal of FNAC is to distinguish a benign parotid mass from a malignant one. With this preoperative diagnostic information, the surgeon may consider adjunctive or more extensive surgical strategies for parotidectomy [11]. Accurate tumor typing is less important and may be deferred to the definitive histological examination [2].

In our series, the sensitivity of FNAC was 57.9%, the specificity 97.8%, the PPV 91.7% and the NPV 84.9%. Overall accuracy of FNAC in diagnosis of parotid masses was 86%. Lurie et al. [12] found in their study the sensitivity, specificity and the accuracy of FNAC for parotid masses were 66, 100 and 69.2% respectively. The sensitivity, specificity, PPV, NPV and the accuracy of FNAC for parotid lumps in Zbaren's study were 64, 95, 83, 87 and 86%, respectively [2]. Lim et al. [3] found the sensitivity and specificity of FNAC in the diagnosis of malignant tumors 80 and 100%, respectively. In another study Stow et al. [13] noted that the sensitivity, specificity and accuracy in their series were 86.9, 96.3 and 92.3%, respectively. In the Aversa's study [6], the sensitivity was 83%, the specificity and the accuracy were reported as 100 and 97% respectively.

In the recent literature, the sensitivity has ranged from 54 to 95%, the specificity from 86 to 100%, and the accuracy from 84 to 97% [2, 3, 6, 12, 13]. Our findings are comparable to previous published series.

Cytological diagnosis of parotid mass is affected by two important problems. In one side, non-diagnostic specimen, which is defined as inadequate material obtained for cytologic diagnosis. On the other side, misdiagnosis, that may be related to low experience of pathologist and the kinds of cells in specimen. Non-diagnostic and inadequate smears have been reported in

Table 1 Comparison between histological and cytological results

	Histological diagnosis		Total
	Benign	Malignant	
FNAC			
Benign	45	8	53
Malignant	1	11	12
Total	46	19	65

Table 2 Histological diagnoses of parotid masses

Histology	Numbers
Pleomorphic adenoma	32
Warthin's tumor	7
Vascular tumors	4
Sialoadenitis	2
Mucoepidermoid carcinoma	9
Adenoid cystic carcinoma	3
Adenocarcinoma	2
Acinic cell carcinoma	2
Squamous cell carcinoma	1
Malignant mixed tumor	1
Total	65

2–10% of cases in the literature [2]; in our cases we observed 5 of 70 (7%) inadequate smears.

We excluded these inaccurate results from the statistical analysis the same as several previous studies [8, 9, 14, 15]. In those studies, a test was interpreted just when it was done properly. Those authors believed that the accuracy of cytologic diagnosis of a mass could be calculated when enough specimen has been obtained. Other studies have included non-diagnostic specimens in the statistical analysis which consequently led to the relatively high rate of false negative results [2, 3, 6, 9, 12, 13]. In other words, the sensitivity of FNAC is affected by this high false negative rate.

The most important reasons that lead to non-diagnostic samples are:

- Low experience of the clinician who takes the specimen [2, 9].
- Cyst formation, necrosis and hemorrhage within a parotid mass [2, 6].
- Very firm lesions with low cellularity [6].
- Taking specimen from small nodules [6].

The most important reasons that lead to misdiagnosis and high rate of false negative are:

- Low experience of the pathologist who interprets the specimen [2, 9].
- The histopathology of parotid tumors is diverse and heterogeneous that makes it difficult to diagnose based solely on FNAC. Atypical cells can be found in both benign and malignant tumors [3].
- Chronic reactive sialoadenitis may frequently be associated with several types of malignancy. Therefore, in some malignant cases, reactive sialoadenitis may be diagnosed by FNAC [6].
- Diagnosing lymphoma is difficult, even among experienced cytopathologist. It is due to the difficulties in cytologically distinguishing small neoplastic lymphocytes of a low grade lymphoma from small reactive lymphocytes [3, 12, 13].

How could we improve FNAC results for diagnosis of parotid masses? Low percentages of non-diagnostic smears are achieved by considering following points:

- Smears are examined immediately by a cytopathologist and the procedure is repeated in the case of inadequate material [2, 16].
- Specimens should be taken by well experienced clinicians [2, 9].
- Specimens, especially from small, deep, cystic, hemorrhagic and necrotic masses, are better to be taken under ultrasound guide [12].
- In cystic, hemorrhagic and necrotic masses, it is better to tap the fluid before taking the material for FNAC.

- All parotid masses clinically suspected for malignancy with a non-diagnostic or negative finding on FNAC, must be aspirated again [2].

Diagnosing malignant parotid tumors based solely on clinical features is difficult. Most malignancies present in a similar fashion as benign tumors. Signs and symptoms of malignancy, such as pain, facial nerve palsy, enlarged cervical lymph nodes are only present in approximately 25–35% of patients [17]. Preoperative diagnosis of malignancy helps the surgeon to choose the best treatment plan [3, 6, 18]. Therefore, we believe that FNAC has a definite role in the evaluation of parotid masses and should be incorporated as part of the holistic management in patients who present with a parotid mass. Attempts to reduce non-diagnostic and false negative results should be considered by clinicians and pathologists.

Conclusion

FNAC is a reliable method in the evaluation of parotid masses with an acceptable specificity and sensitivity rate. This method bears unquestionable value in cases of differential diagnosis between glandular, lymph node, inflammatory, and neoplastic diseases and between benign and malignant neoplasms. It is a rapid, cost-effective, easy-to-perform, and well-tolerated procedure which carries a low risk of complications. The non-diagnostic and false-negative results are the limitations of FNAC that should be reduced to improve its usefulness in the evaluation of parotid tumors.

Conflict of Interest The authors declare that they have no conflict of interest.

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